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METHOD AND APPARATUS FOR USER-CONTROLLED SELECTIVE OVERLAY IN A STREAMING MEDIA

CROSS REFERENCE TO RELATED APPLICATIONS

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The present invention is related to applications entitled METHOD AND APPARATUS FOR DYNAMIC DISTRIBUTION OF CONTROLLED AND ADDITIONAL SELECTIVE OVERLAYS IN A STREAMING MEDIA, serial no. _____, attorney docket

10 no. AT9-99-250; and METHOD AND APPARATUS FOR DYNAMIC DISTRIBUTION OF CONTROLLED AND ADDITIONAL SELECTIVE OVERLAYS IN A STREAMING MEDIA, serial no. _____, attorney docket no. AT9-99-255; all of which are filed even date hereof, assigned to the same assignee, and

15 incorporated herein by reference.

BACKGROUND OF THE INVENTION

20 ### 1.   Technical Field:

The present invention relates to the field of computer software and, more particularly, to methods of providing streaming media to users.

25 ### 2.   Description of Related Art:

Internet, also referred to as an "internetwork", in communications is a set of computer networks, possibly dissimilar, joined together by means of gateways that handle data transfer and the conversion of messages from

30 the sending network to the protocols used by the receiving network (with packets if necessary). When capitalized, the term "Internet" refers to the collection of networks and gateways that use the TCP/IP suite of protocols.

The Internet has become a cultural fixture as a

source of both information and entertainment. Many
businesses are creating Internet sites as an integral part
of their marketing efforts, informing consumers of the
products or services offered by the business or providing

5   other information seeking to engender brand loyalty. Many
federal, state, and local government agencies are also
employing Internet sites for informational purposes,
particularly agencies which must interact with virtually
all segments of society such as the Internal Revenue

10 Service and secretaries of state. Operating costs may be
reduced by providing informational guides and/or
searchable databases of public records online.

　　　　Furthermore, the Internet has destroyed traditional
geographic and technical barriers to distribution of

15 multimedia content. Traditionally, multimedia content has
been distributed via broadcast television (sometimes in
combination with radio), moving pictures (film), and, more
recently, cable television. Much of this multimedia
content was only available within limited geographic areas

20 and presented in one language.

　　　　To reach wider audiences and provide consumers with
more choices, television broadcasts have employed SAP
broadcasting in which a television broadcast contained
audio tracks for several different languages for the same

25 video content. However, SAP is an all or nothing choice.
That is, a user must choose one audio track. The
possibility of mixing several audio tracks together is
non-existent using SAP.

　　　　Another method television broadcasters have used to

30 provide users with more choices over the presentation of
programming is "simulcast". With this technology, a
different audio track was broadcast via radio to
correspond to a simultaneously broadcast television

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program. However, this involved the use of two different media. Furthermore, only the whole of the audio sound track was broadcast, not pieces of it which could be selectively filtered. Additionally, this method did not
5 contain any other video components and there was not a single point of control. "Simulcast" required two points of control: a television and a separate radio.

Currently, the potential is available for anyone anywhere in the world to view content being broadcast from
10 anywhere in the world. This potential needs to be realized and requires a new technology to reduce overall bandwidth while providing viewer centric content as a way of differentiating a broadcaster from his competition in the world market. Also, to encourage viewers to watch
15 an event or program it is desirable to appeal to as many different types of viewers as possible. In some cases, events or programs may be broadcast in different languages. This type of customization typically requires a separate broadcast for each language. This type of
20 customization requires bandwidth for the audio and video for each version. As a result, bandwidth is wasted by rebroadcasting an event for each versions. Thus, it would be advantageous to have an improved method and apparatus to allow customization of the presentation of
25 events to fit the viewing patterns, wants, and needs of present day consumers and reduce bandwidth needed to customize events.

SUMMARY OF THE INVENTION

The present invention provides a method and apparatus for tailoring a multimedia presentation of an event on a computerized multimedia system. A set of video streams, a set of audio streams and a set of information streams are provided for the event via a network coupled to the computerized multimedia system. Video streams are selected for presentation from the set of video streams for the event. Audio streams are selected for presentation from the set of audio streams for the event. Information streams are selected for presentation from the set of information streams for the event. Responsive to user input, selected video streams and the selected audio streams are assigned to respective portions of video and audio output devices. The event is presented according to selected video stream and audio stream assignments.

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BRIEF DESCRIPTION OF THE DRAWINGS

5   The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in

10   conjunction with the accompanying drawings, wherein:

Figure 1 depicts a pictorial representation of a distributed data processing system in which the present invention may be implemented;

Figure 2 depicts a block diagram of a data

15   processing system which may be implemented as a server in accordance with the present invention;

Figure 3 depicts a block diagram of a data processing system in which the present invention may be implemented;

20   **Figure 4** shows a block diagram broadly illustrating the process of the present invention;

Figure 5 is a block diagram of functional components used in the selection of media streams depicted in accordance with the present invention;

25   **Figure 6** is a diagram illustrating an example display depicted in accordance with a preferred embodiment of the present invention;

Figures 7A-7D are diagrams illustrating data structures contained within data streams sent to a client

30   depicted in accordance to a preferred embodiment of the present invention;

Figure 8 is a flowchart of a process used to process

data streams depicted in accordance with a preferred embodiment of the present invention;

Figure 9 is a flowchart of a process for generating CRC values for use in synchronizing data streams depicted

5   in accordance with a preferred embodiment of the present invention; and

Figure 10 is a flowchart of a process for synchronizing data streams using CRC data depicted in accordance with a preferred embodiment of the present

10   invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the figures, and in particular

5   with reference to **Figure 1**, a pictorial representation of
a distributed data processing system is depicted in which
the present invention may be implemented.

Distributed data processing system **100** contains
network **102**, which is the medium used to provide

10   communications links between various devices and
computers connected within distributed data processing
system **100**. Network **102** may include permanent
connections, such as wire or fiber optic cables, or
temporary connections made through telephone connections.

15   In the depicted example, server system **104** is
connected to network **102**, along with storage unit **106**.
Server system **104** may contain one or more server
computers for providing data streaming. For example, a
server may be used to administer and control data streams

20   while another server within server system **104** is employed
to originate resource data streams to clients. The
information in these data streams may be stored within
server system **104** or on a remote storage device, such as
storage device **106**. In addition, clients **108**, **110** and

25   **112** are also connected to network **102**. These clients,
108, **110** and **112**, may be, for example, without
limitation, personal computers, set top boxes, web TV
units, or any other hardware unit for receiving data
streams. Clients **108**, **110** and **112** are clients to server

30   system **104**. In the depicted example, server system **104**
provides data streams to clients **108-112**. Distributed
data processing system **100** may include additional

servers, clients, and other devices not shown.

Clients **108**, **110**, and **112** include mechanisms for mixing and filtering data streams received from server system **104** or other server systems not shown. These

5   mechanisms may be implemented in hardware, software, firmware, or some combination thereof in the depicted examples.

Distributed data processing system **100** may be, for example, the Internet, with network **102** representing a

10   worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers consisting of thousands of commercial,

15   government, education, and other computer systems that route data and messages.

Another implementation for network **102** is as a broadband network, also referred to as a broadband integrated services digital network (BISDN). In such a

20   network, broadband services typically provide channels capable of supporting data transmission rates of greater than 1.5Mbps or a primary rate in integrated services digital network (ISDN), T1, or DS1. In broadband system, the type of transfer mode typically is a synchronous

25   transfer mode (ATM) with the use of synchronous optical network (SONET) and intelligent network (IN) technologies as providing the framework for ISDN. In such a network, information including voice, data, video, and audio are transferred through the network to various clients.

30   Further, network **102** also may be a cable communications system depending on the implementation. Of course, distributed data processing system **100** also may

be implemented as a number of different types of networks such as, for example, an intranet or a local area network. **Figure 1** is intended as an example and not as an architectural limitation for the processes of the

5   present invention.

Referring to **Figure 2**, a block diagram of a data processing system, which may be implemented as a server system, such as server system **104** in **Figure 1**, is depicted in accordance with the present invention. Data

10 processing system **200** may be employed as a video server or other application server within a server system.

Data processing system **200** may be a symmetric multiprocessor (SMP) system including a plurality of processors **202** and **204** connected to system bus **206**.

15 Alternatively, a single processor system may be employed. Also connected to system bus **206** is memory controller/cache **208**, which provides an interface to local memory **209**. I/O bus bridge **210** is connected to system bus **206** and provides an interface to I/O bus **212**.

20 Memory controller/cache **208** and I/O bus bridge **210** may be integrated as depicted.

Peripheral component interconnect (PCI) bus bridge **214** connected to I/O bus **212** provides an interface to PCI local bus **216**. A number of modems **218-220** may be

25 connected to PCI bus **216**. Typical PCI bus implementations will support four PCI expansion slots or add-in connectors. Communications links to network computers **108-112** in **Figure 1** may be provided through modem **218** and network adapter **220** connected to PCI local

30 bus **216** through add-in boards.

Additional PCI bus bridges **222** and **224** provide interfaces for additional PCI buses **226** and **228**, from

which additional modems or network adapters may be supported. In this manner, server **200** allows connections to multiple network computers. A memory mapped graphics adapter **230** and hard disk **232** may also be connected to

5   I/O bus **212** as depicted, either directly or indirectly.

Those of ordinary skill in the art will appreciate that the hardware depicted in **Figure 2** may vary. For example, other peripheral devices, such as optical disk drives and the like, also may be used in addition to or

10 in place of the hardware depicted. The depicted example is not meant to imply architectural limitations with respect to the present invention.

The data processing system depicted in **Figure 2** may be, for example, an IBM RS/6000, a product of

15 International Business Machines Corporation in Armonk, New York, running the Advanced Interactive Executive (AIX) operating system.

With reference now to **Figure 3**, a block diagram of a data processing system in which the present invention may

20 be implemented is illustrated. Data processing system **300** is an example of a computer. Data processing system **300** employs a peripheral component interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures, such as Micro

25 Channel and ISA, may be used. Processor **302** and main memory **304** are connected to PCI local bus **306** through PCI bridge **308**. PCI bridge **308** may also include an integrated memory controller and cache memory for processor **302**. Additional connections to PCI local bus

30 **306** may be made through direct component interconnection or through add-in boards. In the depicted example, local area network (LAN) adapter **310**, SCSI host bus adapter

312, and expansion bus interface **314** are connected to PCI local bus **306** by direct component connection.   In contrast, audio adapter **316**, graphics adapter **318**, and audio/video adapter (A/V) **319** are connected to PCI local

5   bus **306** by add-in boards inserted into expansion slots. Expansion bus interface **314** provides a connection for a keyboard and mouse adapter **320**, modem **322**, and additional memory **324**.   In the depicted example, SCSI host bus adapter **312** provides a connection for hard disk drive

10   **326**, tape drive **328**, CD-ROM drive **330**, and digital video disc read only memory drive (DVD-ROM) **332**.   Typical PCI local bus implementations will support three or four PCI expansion slots or add-in connectors.

An operating system runs on processor **302** and is
15   used to coordinate and provide control of various components within data processing system **300** in **Figure 3**. The operating system may be a commercially available operating system, such as OS/2, which is available from International Business Machines Corporation.   "OS/2" is a
20   trademark of International Business Machines Corporation. An object oriented programming system, such as Java, may run in conjunction with the operating system, providing calls to the operating system from Java programs or applications executing on data processing system **300**.
25   Instructions for the operating system, the object-oriented operating system, and applications or programs are located on a storage device, such as hard disk drive **326**, and may be loaded into main memory **304** for execution by processor **302**.

30   Those of ordinary skill in the art will appreciate that the hardware in **Figure 3** may vary depending on the implementation.   For example, other peripheral devices,

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such as optical disk drives and the like, may be used in addition to or in place of the hardware depicted in **Figure 3**. The depicted example is not meant to imply architectural limitations with respect to the present

5   invention. For example, the processes of the present invention may be applied to multiprocessor data processing systems. Additionally, data processing system **300** may take the form of a notebook computer or a personal digital assistant (PDA). Further, the data

10   processing system may be, for example, without limitations, a television or settop cable box containing appropriate hardware and software for implementing processes of the present invention.

The present invention provides a method, apparatus,

15   and computer implemented instructions for decreasing bandwidth usage and for providing increased client customization of programs or events. The mechanism of the present invention is directed towards tailoring a multimedia presentation on a multimedia data processing

20   system. This is accomplished by breaking up a program or event into different data streams for different audio and video components. Additional optional data streams may be added to allow for customization of the program or event. A data processing system may receive a set of

25   video and audio streams associated with a program or event. These data streams may be selectively presented based on user input. Depending on the user input, some portions of the video and audio data streams may be presented while others are omitted. Further, user input

30   may selectively place a video stream on a display. Also, information streams containing text and/or graphics may be received and selectively displayed in association with the presentation of the program or event. The

combination of these data streams at the user site provides for customization without requiring broadcasting of multiple versions of an event to viewers.

By allowing a viewer to customize a program or
5   event, bandwidth usage may be reduced because program originators do not have to broadcast multiple versions of a program or event for different geographical regions or different viewer basis.

Turning now to **Figure 4**, there is shown a block
10   diagram broadly illustrating the process of the present invention. A client **400**, such as data processing system **300** in **Figure 3**, sends a request **402** for programming content to an originating server **404**. Originating server **404** is a data processing system, such as data processing
15   system **200** in **Figure 2**, and is the host for the programming content requested by client **400**. Originating server **404** sends the requested programming as a set of data streams **406** back to client **400**. Data streams **406**, may be used to present programming or events to a user at
20   client **402**. Furthermore, data streams **406** may comprise one or more video stream components, one or more information stream components, and one or more audio stream components.

Client **400** and originating server **404** have been
25   described and illustrated in **Figure 4** as though they are directly connected. However, client **402** and originating server **404** are preferably part of a distributed data processing system such as distributed data processing system **100** and are linked together via a network, such as
30   network **102** in **Figure 1**.

Turning next to **Figure 5**, a block diagram of functional components used in the selection of media

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streams in accordance with the present invention is depicted. In this example, client **500** includes a data stream processing system **502** to receive data streams **510** from a network **504** for output to output system **506**. The

5   selection of data streams received from network **504** are controlled through user control **508**, which controls data stream processing system **502**.

Multiple data streams may be received from network **504** through connection **508**. These data streams may be,

10   for example, audio, video, text, graphics, or other information that may be displayed through output system **506** to a user of client **500**. Selection filtering of data streams from network **504** by data stream processing system **502** are controlled through user control **508**. The

15   selected data stream or selected portions of data streams are displayed to user through output system **506**, which may be used to drive displays and audio output devices, such as a high definition television or speakers.

With reference now to **Figure 6**, a diagram

20   illustrating an example display is depicted in accordance with a preferred embodiment of the present invention. In this example, a presentation system **600** is presented with a display unit **602**, audio sources **604**, **606**, and **608**. Presentation system **600** is the part of a client through

25   which the user sees and hears programs. In this example, audio source **604** is a left speaker while audio source **608** is a right speaker. Audio source **606** is the center speaker in this example. The video **610** is displayed in display **602** with text box **612**, text box **614**, and video

30   **616**. Video **610** is the primary data stream in this example with text box **612** and text box **614** being overlaid

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over video **610**.

Text box **612** and text box **614** are generated from two data streams in this example. Text box **612** is a stationary text box, which may be used to provide

5   information, such as statistics about the program, upcoming programs, or any other information the user may select. Text box **614** in this example is a "pop-up," which may be used to provide information about a particular object or person in video **610**.

10   Additionally, the data packets in text box **614** may include data to reposition text box **614** to follow a particular object or person. Video **616** is displayed using another data stream to provide additional viewing for the user. For example, video **616** may provide

15   different perspectives in the program or may illustrate scene not currently displayed within video **610**. Initially, the user may select various audio streams for feed through **604**, **606**, and **608**. For example, if the programming being displayed is a sporting event, the user

20   might select a particular player and have audio information about that player played over **608** or have direct feeds from a microphone located on the player played through **604**.

By way of example, consider a football game being

25   broadcast across the Internet or a broadband network. The end user is able to select from and mix several audio streams. For example, the quarterback microphone of either team, the coach's microphone of either team, and/or the announcers, of which, there could be several

30   (e.g., John Madden, Phil Simms, Howie Long, Bruce Beadle, Michael Paolini, etc.). In this manner, the user is able to tune-out (deselect) John Madden if they find him

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offensive. The user might instead choose to listen to the Quarterback microphone of the 49er's (or the opposing team, or another announcer of their choice, or to listen in another language entirely) without having to change

5 the channel/coverage.

Carrying the football example further, with the present invention, it is possible to have a separate audio track for viewers that are new to the sport. This separate audio track would explain the rules of the game

10 and what is happening in additional detail. It would also explain the technical jargon particular to football. The user may choose to have this additional information presented as a text stream.

In yet another example of the use of the present

15 invention, continuing with the football theme, the user could place team A's player voices on the right channels with team B's player voices on the left channels and the announcers' voices on the rear channels. Furthermore, the user could select the player with the ball such that

20 this player's voice is always on the center channel.

One primary data stream representing the video (which does not change no matter which audio overlay streams are selected), and many small add-on data streams representing audio or video overlays may be used to

25 present the program. These streams could be mixed together or assigned to channels (right, left, rear, center, etc.) and/or 3-D positional locations using the latest "Dolby Digital" from Dolby Laboratories and other similar technologies. In addition, the volume could be

30 adjusted on a per-overlay basis. More information on technologies, such as "Dolby Digital" may be found in United States Patent No. 5,912,976.

With respect to video overlays, several video

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overlays can also be streamed and selected in a manner
similar to the audio streaming and mixed to "overlay" the
final video. If, for example, the desired overlay was a
balloon shaped pop-up at a certain video display position
5   containing some text, then the additional overlay stream
would not have to be video itself, but rather the
information to create the overlay video. Therefore, the
size of the data stream would be much, much smaller than
a primary video stream. Additionally, unrelated
10 information in addition to the data streams selected for
an event, such as, for example, stock market data or news
headlines also may be provided to the user. If, for
example, the event or programming being viewed is that of
a football game, it is possible to have a video overlay
15 stream dedicated to displaying pop-up balloons with data,
such as statistics on players in which these pop-up
balloons may appear over the players themselves.
Additionally, betting odds, other interesting facts about
the players, or rules and information about events may be
20 displayed in this manner. Another type of data stream
may include embedded pictures of players with biographies
tagged on as well.

       For other types of programming, other pop-up windows
may be provided. For example, for a murder mystery show,
25 pop-up windows giving clues about future events may be
displayed or facts about actors, the script, or director
also may be displayed in association with the program.
In the case of a murder mystery show, different levels of
clues may be provided depending the selection made by the
30 user.

       In this manner, in the context of the football game
example, it is possible to have video overlay streams
dedicated to displaying pop-up balloon(s) with data such

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as: statistics on players (they very well might appear over the players themselves), betting odds, odd or interesting facts, information explaining what is happening and rules (for novices), a summary of different

5   on-going sporting event data (such as scores and statistics from other games in progress), stock market data, and news headlines to provide but a few examples. Another stream type might contain embedded pictures of the players with bios tagged on as well.

10   In another embodiment, it is possible to make the overlays selectable. That is to say that the user might do the equivalent of "clicking" on one, to trigger additional overlay streams, or lock it in place. For example, selecting a player's "name overlay" might for

15   example bring up an overlay with that player's biography. In a one-way system, this could be done by having an overlay channel which continually cycles through all the players biographies, and having the client "select" the one of interest at the time of broadcast.

20   Additionally, the user could select between the different options using their client and thus have a lot more control of the information they would like to see and hear during a broadcast.

        Turning now to **Figures 7A-7D**, diagrams illustrating

25   data structures contained within data streams sent to a client are depicted in accordance with a preferred embodiment of the present invention. In **Figure 7A**, a data packet **700** is shown in which the data packet includes a header **702** and a payload **704**. Header **702**

30   contains information used in routing and handling data contained within payload **704** of data packet **700**.

        In **Figure 7B**, an example of header information found

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within a data packet, such as data packet **700**, is shown.
In this example, header **706** includes an ID field **708**, a
channel field **710**, a position field **712**, and a volume
field **714**.

5   In this example, header **706** is a header identifying
an audio packet. ID field **708** is used to identify the
type of data packet. Channel field **710** in this example
may be used to identify the channel or channels in which
the data packet is to be presented to the user. For

10   example, channel field **710** may be used to identify
channels such as those in a surround system. The
channels may be, in this example, right, left, rear, or
center. Additionally, position field **712** also is
included such that three dimensional positional locations

15   using sound technologies such as Dolby Digital may be
employed. This positional information may provide a
default positioning that may be altered by a user. Volume
field **714** is included to allow for adjusting the volume
of the data in this data packet relative to other data

20   packets to allow for overlays or emphasis for different
data streams. Other fields may be used in addition to or
in place of fields shown in header **706** for presenting
audio information.

In **Figure 7C**, a header **716** is an example of header

25   information found in a video packet used in a video
stream. In this example, header **716** includes an ID field
718, a time stamp field **720**, and a CRC field **722**. ID
field **718** is used to identify the type of data contained
within the packet, while time stamp **720** in this example

30   is used for synchronization purposes. CRC field **722** may
be used for error checking or synchronization purposes
depending upon the implementation. If CRC field **722** is

used for synchronization purposes, the CRC data is calculated for another data stream and placed within this field prior to being transmitted or broadcast to a viewer. The CRC data may be, for example, calculated for
5   a frame or a portion of a frame in the other data stream. When this data stream and the other data stream are received, CRC data is calculated for a frame in the other data stream. This calculated CRC data is compared with the CRC data stored in CRC field **722**. Matches between
10 these CRC values are used to identify synchronization points between the two data streams.

Next, in **Figure 7D**, another example of a header used for data packets in a video stream is illustrated. Header **724** includes an ID field **726**, a type field **728**, a
15 location field **730**, a duration field **732**, and a z depth field **734**. ID field **726** is used to identify the data packet as containing video data. Type field **728** in this example may be used to identify the type of video, such as text, or a frame in a moving video stream. Location
20 field **730** may be used to identify the location on the screen at which the data is to be displayed. Duration field **732** may identify the amount of time the data is to be displayed. Z depth field **734** may be used to identify the depth or order in which the data is to be displayed
25 relative to other video streams.

In the example, header **724** is an example of a header used for a video stream containing text to be displayed as a balloon or pop-up on the screen. In this case, duration field **732** identifies how long the text is to be
30 displayed while the z depth field **734** identifies where the text is to be located with respect to other video streams. The z depth is used to determine the order in

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which video streams or overlays are displayed on the
display. Location field **730** provides the xy location on
the screen. In the text for display in the pop-up would
be found in the payload. In this manner, a video overlay
5   stream dedicated to displaying text, may be used along
with moving video data streams.

The present invention also provides for
selectability of these different data streams. For
example, user may be able to press a selected button to
10 trigger additional overlay streams or to lock one in
place. For example, selecting a player's "name overlay"
might bring up an overlay with that player's biography.
In a one way system, this may be performed by having a
overlay channel which continually cycles through all of
15 the players' biographies and having the client machine
select the one of interest at the time of broadcast. In
this manner, user may select between different options
and have more control on the information that the user
desires to see and hear during a program. The selections
20 may be implemented via a one way or two way communication
depending on the bandwidth and type of network in use.

Overlay streams may be controlled from the server.
In such a case, a command may be imbedded in an overlay
or a set of commands may be imbedded to cause overlays to
25 be selected or deselected on the client. Such a
mechanism would allow for switching selected overlays off
to broadcast an important event, and then resuming the
previous programming.

Turning now to **Figure 8**, a flowchart of a process
30 used to process data streams is depicted in accordance
with a preferred embodiment of the present invention. To
start, a user selects programming to be retrieved from a
distributed database (step **800**). The user receives

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multiple video and audio streams corresponding to the
selected program (step **802**). The user selects audio
streams (step **804**), either directly in real time or
through the use of user defined configurations, and, if
5   more than one audio stream is selected (step **806**), then
the user configures the presentation profile for the
selected audio streams (step **808**). For example, if three
audio streams are chosen, the user could configure the
system to play one audio stream on the left channel, one
10   audio stream on a center channel, and one audio stream on
a right channel. Alternatively, the user could configure
the presentation of the selected audio streams such that
the volume of one audio stream is louder than the volume
of the other two audio streams.

15   Next, the user selects, from the plurality of video
streams received, one or more video streams to be
displayed (step **811**). If more than one video stream is
selected (step **814**), then the user configures the
presentation of the multiple video streams (step **816**).
20   For example, one video stream could be presented on the
left side of the video display and a second video stream
could be presented on the right side of the video
display. In another example, one video stream might
occupy the entire video display screen, while a second
25   video stream was placed in a smaller window within the
first video stream. Also, video streams are configurable
for such things as opacity and scaling, as well as other
factors. Opacity is the semi-transparency as seen in
menus overlaid on an event in which the event can be seen
30   through the menu. Scaling may be employed to size
display of a video stream on a display device.

        Once the media streams are selected and configured

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by the user, the audio and video streams are synchronized to each other (step **818**) and presented to the user in a user configured manner (step **820**).

With reference again to step **806**, if more than one 5 audio stream is not selected, then the user selects, from the plurality of video streams received, one or more video streams to be displayed (step **811**).

With reference again to step **814**, if more than one video stream is not selected, the audio and video streams 10 are synchronized to each other (step **818**) and presented to the user in a user configured manner (step **820**). Several mechanisms may be employed to synchronize the data streams. For example, a time stamp may be sent with each packet of data in each media stream, then each 15 selected data stream is synchronized to be presented to the user such that data packets with identical time stamps are presented at the same time.

Each data stream also may contain a spike in the data that appears at a periodic rate. The spike in the 20 data may be, for example, a data packet that contains no video or audio. Further, each data stream contains a larger spike that appears at a longer periodic rate. For example, the shorter spike may appear every 30 frames wherein the larger spike appears every 10 seconds. The 25 selected data streams may be synchronized such that they are presented to the user such that the spikes appear in the data streams simultaneously. The longer spike enables the system to resynchronize itself periodically if the data streams have become separated by a period of 30 one or two smaller data spikes.

In a third method of synchronization, cyclic redundancy check (CRC) values. Synchronizing data streams

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using a CRC data involves calculating CRC data for a
first data stream and placing those calculated values in
the headers of data packets in the second data stream.
The CRC values are placed in data packets in the second
5   data stream that should be synchronized with data packets
in the first data stream.

Turning to **Figure 9,** a flowchart of a process for
generating CRC values for use in synchronizing data
streams is depicted in accordance with a preferred
10   embodiment of the present invention. The process
illustrated is used for video streams, but may be applied
to other types of data streams.

The process begins by selecting an unprocessed frame
(step **900**). This step selects the first unprocessed
15   frame for content that will be transmitted as a data
stream. A CRC value is then calculated for the frame
(step **902**). The CRC value may be calculated for an
entire frame or different portions of the frame. For
example, the CRC value may be based on the first five
20   bytes of the frame, five bytes in the middle of the
frame, and the last five bytes in the frame.

Next, the portion of a second data stream that is to
be synchronized with this frame is identified (step **904**).
The CRC value is then placed into the header of a data
25   packet for that portion of the data stream (step **906**). A
determination is then made as to whether additional
unprocessed frames are present for processing (step **908**).
If additional unprocessed frames are present, the process
returns to step **900**. Otherwise, the process terminates.

30   The process in **Figure 9** may be used when the data
streams are transmitted or broadcast. Alternatively,
these processes may be initiated prior to transmitting or

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broadcasting a data stream. In such a case, the CRC values may be stored and added to the second data stream when that data stream is transmitted.

Turning now to **Figure 10,** a flowchart of a process
5   for synchronizing data streams using CRC data is depicted in accordance with a preferred embodiment of the present invention. The processes illustrated in **Figure 9** may be implemented at the viewer site to synchronize incoming data streams for presentation of a program or event.
10   The process begins by receiving data streams (step **1000**). In step **1000**, the data streams are received for presentation. These data streams are placed in a buffer prior to presentation (step **1002**). A CRC value is calculated for a frame in the first data stream stored in
15   the buffer (step **1004**). Thereafter, the calculated CRC value is compared to CRC values in the second data stream stored in the buffer to identify a point in the second data stream containing a matching CRC value (step **1006**). In the depicted examples, CRC values are placed within
20   headers in the second data stream at points where the CRC value should match a calculated CRC value from a portion of the first data stream. Thereafter, the first and second data stream are presented at the matching or synchronization points (step **1008**) with the process then
25   returning to step **1000.** The present invention could be implemented via one-way or two-way communication depending on the bandwidth of the network type in use.

Thus, the present invention provides a customized experience for a user. The present invention provides
30   this customized experience by providing a number of different types of data streams, audio and video, which are delivered to a client in which the client may select

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from these data streams to customize the program or event being viewed by the user. Further, the present invention allows for decreasing the amount of bandwidth needed to provide customized programming. Currently, a data stream

5   is created for each version or customization of a program transmitted to viewers in which the audio and video cannot be selectively modified. This advantage is provided by sending a set of data streams from which different users may select a subset of the data streams

10 for customizing a program or event, rather than creating a new data stream in which audio and video are transmitted in an unmodifiable form for each desired customization of a program or event.

It is important to note that while the present

15 invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions

20 and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media such a floppy disc, a hard

25 disk drive, a RAM, and CD-ROMs and transmission-type media such as digital and analog communications links.

The description of the present invention has been presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the

30 invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain the principles of the invention,

the practical application, and to enable others of
ordinary skill in the art to understand the invention for
various embodiments with various modifications as are
suited to the particular use contemplated.